Short note on reduction in hatchling rate: case study of Rayong Province, Thailand

AUTHOR(S):

JUNCHOMPOO, CHALATIP; MONANUNSAP, SOMCHAI; SINRAPASAN, NONGNUT; PENPAIN, CHATCHAI

Short note on reduction in hatchling rate : case study of Rayong Province, Thailand

CHALATIP JUNCHOMPOO[1], SOMCHAI MONANUNSAP[1], NONGNUT SINRAPASAN[1] AND CHATCHAI PENPAIN[1]
[1]*Eastern Marine and Coastal Resources Research Center,*
309 Moo 1 Paknum Prasae, Klaeng , Rayong, 21170, Thailand.
E-mail: Junchompoo@yahoo.com

ABSTRACT
The female green turtle (*Chelonia mydas*) along the Andaman sea coast and in the gulf of Thailand re-migrates every 2-5 years because of the need to accumulate sufficient fat for vitellogenesis and for reproduction. The green turtle nesting on the islands of Rayong Province, Thailand, was investigated during 2008-2009. The objective of this study was to monitor the nesting cycle and hatchling rate of juvenile green sea turtles, and possibly to provide important points to consider in the sea turtle conservation program. As a result of this study, it was found that a female turtle had a 1 year homing migration period, but the rate of hatching was only 13.4 percent. This is lower than the average hatching rate (80% SD) observed on Khram Island, Chonburi Province. This result indicated the critical circumstances of the sea turtle populations along the Rayong coast. Although there have been new female stock recruitment on nesting beaches, unfortunately there has been a reduction in hatching rate (86.3% of the eggs were not fertilized). For the further study, embryology of each embryonic stage should be investigated for more precise results. The female's health status checking should be carried out to rule out the female infertility factor, and to know the main cause of the low hatching rate.

KEYWORDS: sea turtle, green turtle (*Chelonia mydas*), nesting, remigration

INTRODUCTION

The Gulf of Thailand has many important nesting sites. One of the biggest is on Kharm Island, Chonburi Province. There nesting beaches have been protected by the Royal Thai Navy (Charuchinda and Monanunsap, 2000). Along the Rayong Province coastline, on the east coast of the Gulf of Thailand, beaches have been protected by The Department of National Parks, Wildlife and Plants. There are four islands namely Samet (12.560983N, 101.452769E), Talu (12.556561N,101.568551E), Kudi (12.583295N, 101.509874E) and Mannai (12.612891N, 101.689425E) that have had reports of sea turtles nesting on the beaches (Fig. 1). However, on some beaches within the same province, there has been a critical reduction of nesting, caused by human activity (for example, resorts and restaurants) and pollution. Samet Island, in particular, is one of Rayong's most beautiful beaches, attracting tourists all year round. Today, only 1-2 female turtles were found nesting each year. This shows that nesting declined over the last 10 years. However, our records of nesting along the Rayong Province coastline still contain insufficient data to monitor year-round nesting.

The objective of this study was to monitor the nesting cycle and growth rate of juvenile green sea turtles, and possibly to provide important points to consider in the sea turtle conservation program.

MATERIALS AND METHODS

The green turtle nesting on the islands of Rayong Province, Thailand, was investigated during 2008-2009. Female turtles were tagged with Passive Integrated Transponder (PIT tags) and external metal tags on their flippers. Curved carapace length and width were measured and recorded. Where convenient, the body was weighed by hand balance.

The eggs were collected and incubated at the Sea Turtle Conservation Center on Mannai Island. The rate of hatching and the growth rate of juvenile turtles were measured. In addition, female turtle nesting information was collected random from national park officers and resort owners and reported back to the research team.

RESULTS AND DISCUSSION

Five female green turtles were recorded nesting on four beaches on the islands within the Rayong Province during 2008-2009. Three female green turtles were not identified as they laid eggs only one time and never came back again during the time of the survey (Table. 1).

The female body had almost the same size of curve carapace length when comparing to Kharm Island, where it was 97.6 cm in averaged length. (Charuchinda and Monanunsap, 1998) The Costa Rica female was 100 cm in mean length and laid 110 eggs on average (Carr and Goodman, 1970; Bjorndal et. al., 1985).

This study is believed to be the first reported case that the female green turtle has a 1 year remigration interval. The records of the nesting on Kharm Island from 1994 to 2009 showed that out of 141 female turtles (110 green and 31 hawksbill) only 2 female hawksbill turtles had a 1 year remigration interval. (Charuchinda and Monanunsap, unpublished). Generally, female green turtles do not reproduce every year and the period between reproductive seasons is approximately 2-5 years (Charuchinda and Monanunsap, 2000; Godley, 2001), with the possible exception of *L.kempi*. (Hirth, 1971). In their foraging areas, sea turtles accumulate the energy reserves required to support vitellogenesis over a variable period of several years depending, in part, on the quality and quantity of food available. (Bjorndal, 1980)

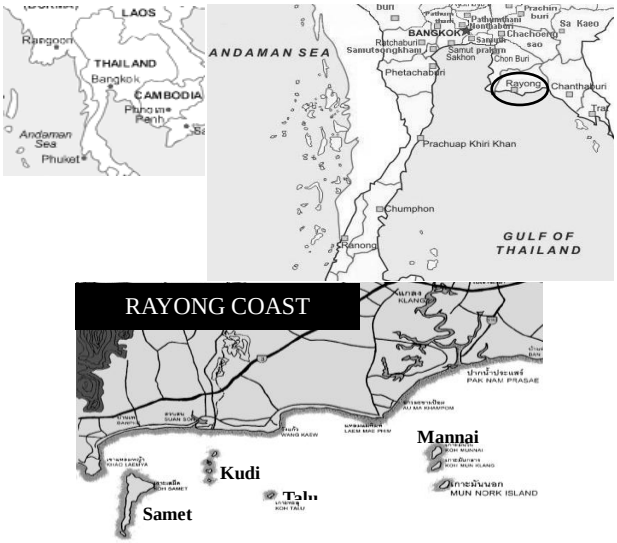

Fig. 1 Map showing of the islands of Rayong Province, Thailand

RESULTS AND DISCUSSION

Five female green turtles were recorded nesting on four beaches on the islands within the Rayong Province during 2008-2009. Three female green turtles were not identified as they laid eggs only one time and never came back again during the time of the survey (Table. 1).

The female body had almost the same size of curve carapace length when comparing to Kharm Island, where it was 97.6 cm in averaged length. (Charuchinda and Monanunsap, 1998) The Costa Rica female was 100 cm in mean length and laid 110 eggs on average (Carr and Goodman, 1970; Bjorndal et. al., 1985).

This study is believed to be the first reported case that the female green turtle has a 1 year remigration interval. The records of the nesting on Kharm Island from 1994 to 2009 showed that out of 141 female turtles (110 green and 31 hawksbill) only 2 female hawksbill turtles had a 1 year remigration interval. (Charuchinda and Monanunsap, unpublished). Generally, female green turtles do not reproduce every year and the period between reproductive seasons is approximately 2-5 years (Charuchinda and Monanunsap, 2000; Godley, 2001), with the possible exception of *L.kempi*. (Hirth, 1971). In their foraging areas, sea turtles accumulate the energy reserves required to support vitellogenesis over a variable period of several years depending, in part, on the quality and quantity of food available. (Bjorndal, 1980)

Table 1 Female green turtles nesting on the islands of Rayong Province, Thailand

Turtle	Island	First recorded	Found	Re-migration interval	inter-nesting interval
No1	Samet	2008	2009	1 yr	11 day
No2	Talu	2006	2009	3 yr	9 day
No3	Kudi	2008	not identified	found 1 nest	-
No4	Mannai	2008	not identified	found 1 nest	-
No5	Talu	2009	not identified	found 1 nest	-

The eggs were collected around Rayong Island, the averaged percentage of hatching was 13.4 percent. This is lower than observed on Khram Island, Chonburi Province, where it was more than 80 percent (Table 2). Whilst the transportation methods from the nesting area to the incubation were not different processes, the hatching method and officer experience of each hatchery were possibly the important factors that had an effect on hatching rate.

This may also have been caused by male efficiency (fertility and population of males in nature) and by global climate change, which are likely to have an important influence on sex ratio and population dynamics (Hays et. al., 2003). The increasing trends of annual female proportion were detected in both Huyong population (from 25% to 80% during 1955-2007) and Khram population (from 35% to 80% during 1995-2007) (Kittiwattanawong, 2008).

However, in this case study, the reduction in hatching rate was difficult to identify based only on male efficiency and climate change, because the success of hatching is dependent on several factors (Ex. female's health, in-breeding, semen quality and mating behavior).

For the further study, the embryology of each embryonic stage should be investigated for

more precise results. The female's health status checking should be carried out to rule out the female infertility factor, and to know the main cause of the low hatching rate. By the way, hatching methods and officer training of each hatchery may be the important factors that effect on hatching rate.

Table 2 Hatching rate on the islands of Rayong Province, compared to Kharm Island

Egg incubation	**Kharm Island 1992-1993**	**Kharm Island 2008**	**Rayong Islands 2008**
Hatching rate	56.50%	80.79%	13.4%
Dead embryos	6.39%	4.36%	3.0%
Undeveloped eggs	37.12%	7.90%	83.6%

However, this result indicated the critical circumstances of the sea turtle populations along the Rayong coast. Although there have been new female stock recruitment on nesting beaches, unfortunately, the success of hatching rate is still low (86.3% of the eggs were not fertilized). Nevertheless, the best way to conserve populations of sea turtle is protect their environment and habitat.

ACKNOWLEDGEMENT

We would like to express our great thanks to PMBC and SEASTAR2000. Critical comments were made by Mr. Somchai Monanunsap, Mr. Mickmin Charuchinda and Dr. Kongkiat Kittiwattanawong. Finally, Thanks to the staff of the Eastern Marine and Coastal Resources Research Center who participated in the surveys and Ms. Emily Lavendar and Mr. Sean for editing the manuscript.

REFERENCES

Bjorndal, K. A.1980. Demography of breeding population of green turtle, *Chalonia mydas*, at Tortuguero, Costa Rica. Copeia.

Bjorndal, K.A., A. Carr, A.B. Meylan and J.A. Mortimer. 1985.Reproductive biology of the hawksbill *Eretmochelys imbricata* at Tortugnero, Costa Rica, with notes on the ecology of the species in the Caribbean. Biol. Cons. **34**: 353-368.

Carr, A. and D. Goodman. 1970. Ecological implications of size and growth in *Chelonia*. Copeia 1970 (3): 783-786.

Charuchinda, M. and Monanunsap. S. 1998. Monitoring survey on sea turtle nesting in the inner gulf of Thailand, 1994-1996.Thai Marine Fisheries Research Bulletin **6**: 17-25.

Charuchinda, M. and Monanunsap. S. 2000.Reproductive biology of green Turtle at Ko Kharm Island, Chonburi Province Thailand. Thai Marine Fisheries Research Bulletin.

Hays, G. C., A. C. Broderick, F. Glen and B. J. Godley 2003. Climate change and sea turtles: a 150-year reconstruction of incubation temperatures at a major marine turtle rookery. Global Change Biology **9(4)**: 642-646.

Kittiwattanawong, K. 2008. Nesting Season of Sea Turtles Fluctuated as a Function of Ambient Temperature. Proceedings of the 8 SEASTAR2000 Workshop and Conference. A. Nobuaki. Bangkok, Thailand, Graduate School of Informatics, Kyoto University, Japan.

Godley, B. J., A., Broderick and G. Hays. 2001. Nesting of green turtles (*Chelonia mydas*) at Ascension Island, South Atlantic.

Hirth H. F., 1971. Synopsis of the biological data on the Green turtle, Chelonia mydas (Linnaeus) 1758, FAO Fish. Synop. 85.

Lutz PL, Musick JA., Wyneken J, editors. 2003. The biology of sea turtles volume II. CRC press LLC, Florida.